filaments with these gall cells the parasite grows out into fruiting branches. Single nuclei enter the single-spored sporangium and later divide twice, producing the four nuclei of each spore (rarely two or more than four).

The association of the plasma of host and parasite in a mixochimaera is supposed to render the protoplasmic membranes of the host permeable to diffusion of the material necessary to the normal growth of the parasite. The galls are also supposed to serve as a means of bringing about a branching of the host hypha in places such as old sporangiophores, where the ability to branch has been lost.

In seeking for a possible origin of the "sikyotic" parasitism (from *σικυα* = a cupping-glass) of *Chaetocladium*, BURGEFF discusses other cases of fusions in the fungi. In the anastomoses found in *Mortierella*, *Syncephalis*, Ascomycetes, and Basidiomycetes, a cross wall, if formed, is produced after the fusion, as shown by KNIEP, but in this case the process is connected with the distribution of nuclei in a diploid mycelium. Failing to find an analogy with vegetative processes, BURGEFF suggests that the curious type of parasitism which he has studied may have originated by way of sexual fusions; and in support of this suggestion points out the similarities between the processes involved in conjugation in the Mucors and those in the formation of his sikyotic galls in *Chaetocladium*. The suggestion is believed to need strengthening by tests with plus and minus races of host and parasite.—A. F. BLAKESLEE.

**Calcium.**—SHEDD[2] has found that the procedure which has been adopted by the Association of Official Agricultural Chemists for determination of calcium in soil solution does not give accurate results, due to the occlusion of calcium on the iron and aluminum precipitate that goes through the filter. He has evolved a new method which is simpler and avoids the errors of the present methods. The following findings for the Kentucky soils are of great interest. Cultivation has caused a considerable loss of calcium from these soils. The best types of these soils have the highest calcium content, and the poorest have the lowest. "Many samples have been found to be so low in calcium that their deficiency in this constituent requires consideration as well as their low phosphorus and nitrogen supply. The application of a ton of limestone or of rock phosphate per acre to such soils frequently adds more calcium than is already present. There is no doubt that, in such cases, these materials, or even moderate applications of some commercial fertilizers, are beneficial because of the plant food (calcium) they supply in addition to other good effects they may accomplish."

NELLER,[3] working on limed and unlimed plots of the New Jersey Experiment Station, finds that the oxidizing power of the limed plots is approxi-

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[2] SHEDD, O. M., A proposed method for the estimation of total calcium in soils and the significance of the element in soil fertility. Soil Science **10**:1–14. 1920.

[3] NELLER, J. R., The oxidizing power of soil from limed and unlimed plots and its relation to other factors. Soil Science **10**:29–37. 1920.

mately 40 per cent higher than the unlimed; that the oxidizing power varies inversely with its lime requirement; that nitrate accumulation and bacterial numbers were higher on the limed soils, whereas the ammonia accumulation was about the same for all of the plots; that the average crop yield for the past 10 years varies closely with the present oxidizing power of the soils; and that there is a noticeable correlation between crop yield, nitrate accumulation, and bacterial numbers, but not between crop yield and ammonia accumulation.

PARKER and TRUOG[4] find a rather close relation between the calcium and nitrogen content of plants. The contents of potassium, phosphorus, and magnesium do not bear this close relation to the nitrogen content. There are two groups of agricultural plants, those having a low calcium-nitrogen ratio and a low lime requirement, and those having a high calcium-nitrogen ratio and a higher lime requirement.—WM. CROCKER.

**Arctic Caryophyllaceae.**—A critical study of the morphology and ecology of the Caryophyllaceae is one of WARMING'S[5] most recent contributions to the science of ecology. He divides his report into four parts, dealing respectively with (1) morphology and vegetative propagation, (2) leaf anatomy, (3) adaptations to environment, and (4) flower biology and seed reproduction.

In the first section he recognizes and describes several growth forms, illustrating by drawings of typical plants and listing the species to be referred to each form. Numerous variations of the rosette and cushion forms are distinguished, and multiplication by buds, offshoots, runners, and layers is carefully discussed. The details of the leaf structure are to be obtained from the drawings, the most important generalization being the usual absence of xeromorphic features. Palisade tissue is poorly differentiated, the mesophyll has abundant large intercellular spaces, stomata usually occur on both surfaces, and the epidermis is thin-walled and but slightly cutinized, the leaves thus resembling those of hydrophytes or shade plants. In this respect they form a striking contrast with the xeromorphic leaves of the woody evergreens of the same regions.

Among the most conspicuous features of the flower biology is the common occurrence of both protandry and polygamy, the latter being accompanied by varying degrees of reduction of stamens in the ovulate flowers. Very frequently the corolla is decidedly smaller in the ovulate flowers.—GEO. D. FULLER.

**Awn and barley yield.**—HARLAN and ANTHONY[6] have found that early removal of the awns of barley greatly reduces the volume and dry matter of

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[4] PARKER, F. W., and TRUOG, E., The relation between the calcium and the nitrogen content of plants and the function of calcium. Soil Science **10**:49–56. 1920.

[5] WARMING, ENG., The structure and biology of Arctic flowering plants. 13. Caryophyllaceae. Meddelelser om Grönland **37**:228–342. *figs. 44*. 1920.

[6] HARLAN, H. V., and ANTHONY, S., Development of barley kernels in normal and clipped spikes and the limitations of awnless and hooded varieties. Jour. Agric. Research **19**:431–472. 1920.